

REMARKS/ARGUMENTS

Favorable reconsideration of this application as presently amended and in light of the following remarks is respectfully requested.

Claims 1-20 are active in this application, Claims 1, 6 and 10 having been amended by the present amendment.

In the outstanding Office Action Claims 1-13 were rejected under 35 USC §103(a) as being unpatentable over Ohnishi et al (U.S. Patent No. 6,153,460) in view of Lee et al (U.S. Patent No. 6,838,369), and Claims 14-20 were allowed.

Applicants acknowledge with appreciation the allowance of Claims 14-20.

In light of the outstanding rejection on the merits, Claims 1, 6 and 10 have been amended to state explicitly that the bottom electrode film, the dielectric film, and the top electrode film are films of a capacitor, consistent with page 9, line 27 – page 10, line 4 of the specification. No new matter has been added.

Briefly recapitulating, as explained in the “Background of the Invention” portion of Applicants’ specification, it is important to avoid the problem that a capacitor dielectric film is reduced by hydrogen, in order to obtain a capacitor which is superior in characteristics and reliability. Further, it is important to avoid the problem that a plug is oxidized in a capacitor-on-plug structure (COP), in which the plug is disposed right under a capacitor.

In order to avoid the above-described problems, it is important to form a protective insulating film which has high hydrogen barrier property and high oxygen barrier property. Since alumina has high hydrogen barrier property and high oxygen barrier property, it is suitable for a protective insulating film for protecting against hydrogen and oxygen.

However, the alumina film involves the problem about that it is hard to obtain satisfactory step coverage. Thus, when the capacitor is formed and thereafter the alumina film is deposited, it is difficult to obtain satisfactory step coverage and as a result the barrier

properties are insufficient. The present invention recited in Claims 1, 6 and 10 addresses and the above-described problem, as next described.

Claim 1 recites “forming an alumina film on the underlying region; forming a hole in the alumina film; filling the hole with a bottom electrode film of a capacitor.” The claimed method thus avoids the above-described problem of the step coverage by filling a hole formed in the alumina film with a bottom electrode film by the so-called damascene method.

Claim 6 recites “forming an alumina film on the bottom electrode film; forming a hole reaching the bottom electrode film in the alumina film; filling the hole with a dielectric film of the capacitor.” The claimed method thus avoids the above-described problem of the step coverage by filling a hole formed in the alumina film with a dielectric film by the damascene method.

Likewise, Claim 10 recites “forming an alumina film on the underlying region; forming a hole in the alumina film; filling the hole with a conductive film to form a plug.” The claimed method thus avoids the above-described problem of the step coverage by filling a hole formed in the alumina film with a conductive film to form a plug by the damascene method.

In contrast to the claimed invention, Ohnishi et al. teaches filling a hole formed in SiO₂ film 6 with Pt film 18a (corresponding to the bottom electrode film of the present invention), as shown in FIGS. 2(a)-2(f). Further, Ohnishi et al. teaches filling a hole formed in SiO₂ film 16 with PZT film 19a (corresponding to the dielectric film of the present invention) and Ir film 20a (corresponding to the top electrode film of the present invention).

However, unlike the alumina film, a SiO₂ film does not have high hydrogen barrier property and high oxygen barrier property. On that account, a SiO₂ film cannot overcome the above-described problem of reduction and oxidation. Ohnishi et al. uses the damascene method simply to prevent a ferroelectric film (a dielectric film of a capacitor) from being

damaged by plasma caused by dry etching (see column 2, lines 48-52). More specifically, Ohnishi et al. does not consider the above-described problem of reduction and oxidation and does not disclose at all using an alumina film to avoid that problem. In view of this deficiency, it is respectfully submitted that Ohnishi et al. clearly does not anticipate or obviate the claimed invention.

Lee et al. discloses using an alumina film as capping layer 108 (see column 3, lines 21-25). However, as is evident from FIGS. 2a-2d, the Lee et al. device is not a capacitor. That is to say, Lee et al. does not relate to a capacitor and there is no relationship between Lee et al. and Ohnishi et al. Therefore, there is no reasonable ground for combining Lee et al. with Ohnishi et al. and such a combination, absent hindsight, is inappropriate.

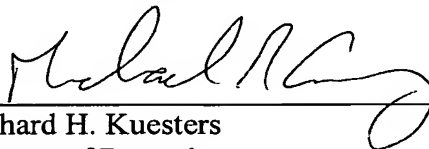
Further, in Lee et al., a stacked structure of conductive pattern 102, hard mask film 104 and spacer 106 is formed and thereafter capping layer 108 (alumina film) is formed to cover the resulting structure. Accordingly, if the teachings of Lee et al. were combined with those of Ohnishi et al., the claimed method still would not be obviated, not to mention that such a combination is inappropriate. More specifically, if the alumina film of Lee et al. (capping layer 108) were applied to Ohnishi et al., a capacitor structure of Ohnishi et al. would be formed and thereafter an alumina film (capping layer 108) would be formed to cover the capacitor structure. Such a method would be different from the claimed method, which is believed to be patentably distinguishing over the cited references whether considered alone or in combination. Accordingly, the outstanding rejection on the merits is believed to have been overcome and withdrawal of this rejection is believed to be warranted and is respectfully requested.

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Consequently, in view of the present amendment and in light of the above comments, no further issues are believed to be outstanding, and the present application is believed to be in condition for formal allowance. An early and favorable action to that effect is respectfully requested.

Respectfully submitted,

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